SOME COSTS OF MAINTENANCE OF MOTOR-DRIVEN DEEP-WELL PUMPS[1]

By Melvin L. Enger

There seems to be very little published information concerning the cost of operation of deep-well pumps. The following notes, although not as complete as might be wished, may therefore be of value.

The water supply of the University of Illinois comes from five wells drilled about 140 feet deep in the glacial drift of this region. The water bearing stratum is about 15 feet thick and consists of sand containing much fine material. The water level in the wells when the pumps are not running is about 95 feet below the surface and when the pumps are running about 110 feet below the surface.

The water is pumped from the wells by means of motor-driven Luitwieler deep well pumps. The working barrels are $5\frac{3}{4}$ inches in diameter and the stroke is 15 inches. The pump on Well 2 is geared directly to its motor, the other pumps are belt-connected.

Table 1 gives information concerning the wells and pumps, and Table 2 the cost of labor and material to operate the pumps for sixteen months.

TABLE 1

Wells and pumps of the University of Illinois

	WELL NUMBER				
	1	2	3	4	5
Date drilled.........................	1900	1907	1904	1905	1914
Depth, feet.........................	138	140	142	140	140 (about)
Diameter, inches....................	8	8	8	12	12
Cost of well, casing and screen.......	$559	$546	$699	$1348	$891
Cost, motor and pump...............	$375	$813	$788	$758	$810
Capacity, g.p.m., 1914 tests..........	60	69	81	71	75
Speed, r.p.m........................	31	33	28	30	30

[1] Read at a meeting of the Illinois Section at Urbana on March 13, 1917.

TABLE 2

Cost of labor and material for operating University wells during sixteen months

DATE	NO. 1		NO. 2		NO. 3		NO. 4		NO. 5	
	Labor	Ma-terial	Labor	Ma-terial	Labor	Ma-terial	Labor	Ma-terial	Labor	Ma-terial
1914										
October....	$11.11	$0.00	$14.15	$1.21	$9.11	$0.00	$15.03	$5.90	$3.43	$1.00
November.	2.60	0.31	3.10	0.00	7.95	1.25	5.15	0.00	35.87	13.18
1915										
January....	1.46	0.94	5.06	0.00	1.86	0.13	42.77	0.15	10.94	6.24
March.....	10.96	10.10	2.26	0.00	7.71	1.52	1.96	0.39	11.70	0.37
April......	3.83	80.84	4.61	0.00	8.18	0.46	5.97	3.30	3.86	1.16
May.......	3.40	0.19	3.59	0.00	27.17	0.27	3.97	0.31	4.38	7.52
June.......	5.92	0.45	7.64	0.33	10.10	0.55	6.49	0.54	7.72	9.15
July.......	49.19	0.64	2.36	0.00	3.23	0.79	2.57	0.14	4.30	0.35
August.....	3.38	0.01	4.01	0.00	3.06	0.00	3.02	0.00	14.42	0.01
October....	6.11	1.64	2.27	0.36	3.80	0.94	6.74	1.09	18.88	0.79
November.	6.75	0.07	0.99	0.20	9.73	1.55	0.66	0.93	4.08	16.30
1916										
January....	5.44	0.07	1.91	0.00	2.44	0.35	1.96	0.15	3.65	0.15
February..	4.62	0.14	0.95	0.15	1.96	0.32	2.95	0.58	17.70	12.15
March.....	2.15	0.00	0.80	0.01	30.69	19.18	1.93	0.00	2.57	18.14
April......	9.13	0.91	1.47	0.00	41.59	14.70	8.82	6.32	1.86	0.00
May.......	16.02	3.95	0.99	0.00	16.15	40.85	3.06	23.12	1.90	1.57
Total....	$172.07	$100.26	$56.51	$2.26	$202.73	$82.86	$113.05	$42.93	$147.26	$88.08

During the period included in Table 2 the wells were in operation the following percentages of the total time: No. 1, 44; No. 2, 34; No. 3, 70; No. 4, 86 and No. 5, 89. Taking the average, the wells were in operation 65 per cent of the total time, or 15.6 hours per day.

The pumps had been in use for periods ranging from one to eleven years, hence the results should represent the average performance of the pumps during their useful life fairly well. The principal cause of trouble is the fine sand getting into the well and into the pump. Rods, couplings, working barrel and packing are worn quite rapidly. The conditions under which the pumps work are decidedly poor, which accounts for the high cost of maintenance.

The total cost of maintenance for the five pumps during the sixteen months was $1008. This is equivalent to a cost of $151 per year for one pump operating 15.6 hours per day. Put in another way, it is equivalent to a maintenance charge of 0.82 cent per 1000 gallons pumped.